C-CORE Publication No 89-11

Proceedings of the Fifteenth
CPA Frontier Division Workshop

"Managing Transition on the Canadian Petroleum Frontiers"

Fairmont, British Columbia
May 8 - 11, 1988

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"The Role of C-CORE in Canadian Cold Oceans Resources Development". Presented at: Managing Transition on the Canadian Petroleum Frontiers, Proceedings of 15th CPA Frontier Division Workshop, Fairmont, BC, May 8-11, 1988, pp. 132-136.

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MR. VIRTUE:

Our next speaker is Jack Clark, who is the Director of the Centre for Cold Ocean Resources Engineering. Jack has been the director of C-CORE for four years. Prior to that, he spent 25 years in consulting engineering work, primarily in western Canada and the arctic. From 1972 to 1977, Jack was the Director of Geotechnical Environmental Services for Northern Engineering Services who were the prime consultants to the Canadian Arctic Gas Project. He is a fellow of the Engineering Institute of Canada and the Canadian Society of Civil Engineers. He serves on the editorial boards of technical journals and several advisory and professional committees.

DR. CLARK:

C-CORE was established in 1975. It was perceived at that time to be an organization that would carry out research or make research happen. This research was needed to contribute to a cost-effective, orderly and safe development of Canada's petroleum resources that lie below the seabed, in waters that are invaded by or covered by ice every year. C-CORE was also seen as a vehicle for the training of students and graduates in engineering and science. These students were to participate in research projects with experienced senior staff in order to better prepare them for future jobs in industry, government or in teaching others.

The Centre's mandate, approved by its governing body in 1975, is equally appropriate for today's needs. It has four components. To paraphrase, the mandate says "get out, on and in the ocean and help fill those gaps in knowledge that need to be filled to make our resources true assets for Canadians. Help to train Canadians so that they can benefit from the development of our ocean resources. Contribute to the development of the region. Finally, communicate what you learn to others who will be helped by that knowledge and do it in a timely manner." While the mandate has remained the same, the concept of what constitutes "resources" has broadened. Whereas development of petroleum resources is still the single most important thrust of the Centre's research programs, much of the present day research is also relevant to the fishing industry, to the transportation industry, to the military, and to offshore minerals, particularly rich placer deposits that exist in many of Canada's nearshore regions. Technology developed to measure and better understand properties of ice and seabed materials is also applicable to other materials and to deposits not under water. Techniques developed to identify ice at great distances beyond the horizon will also detect other objects on or above the ocean. Space research has generated technology that has touched the life of almost every human being; oceans research has the same potential.

Although operating today within a broader context of "resources", C-CORE still limits its research program to three specific areas: Ice Engineering, Seabed Geotechnics and Remote Sensing. Ice remains as a central theme to much of what is done. The Ice Engineering program deals with ice properties, ice dynamics and ice-structure interaction. The Seabed Group has an integrated research program on marine geology, geophysics, and geotechnical engineering.

Although very broad based, particularly in the innovative application of acoustics to the measurement of the properties of the seabed and other materials, much of the research program is directed to understand the forces imparted to the seabed when it is impacted by ice. The Remote Sensing Program has been directed exclusively to ground wave radar research for several years. The Group set out to develop a techniques whereby icebergs, growlers and bergy bits could be seen over the horizon. The program has been very successful in developing the technology to detect ice at great distances from land based stations and has been proven for a distance of 50 kilometres.

A design for a ground wave radar system to look out for a distance of 400 kilometres has been specified. It will be built by a "spin off" company called Northern Radar Systems Limited. This company is owned by the university, the researchers responsible for developing the technology, and a venture capital company. The ground wave radar system has the potential to detect low flying objects. With its defence applications, the ground wave radar technology has attracted widespread interest in Canada and in other nations. If Northern Radar Systems Limited realizes its potential, the people putting up the risk capital will see an exceptionally good return on their investment. The brains behind the system will continue to benefit and will continue to contribute to further development of the technology as they own a piece of the company. C-CORE will receive a part of the profits through the university-based company, Seabright Corporation Limited, which holds shares in the company on behalf of C-CORE. These projects will help to finance continuing research at the Centre and will represent return on the investment of the financial supporters of C-CORE. In-house research at the Centre is continuing to develop the technology required to operate a ground wave radar system from a drilling rig or a vessel. This capability should be in a position to be transferred to industry in two to three years.

C-CORE now has a staff of 55 persons. These include 10 support people responsible for financial, public relations, administration and information services. All the rest of the staff are involved in research. In the research group, 10 are senior staff with several years experience, with most of them having spent a period of time in industry. The remainder are relatively young, bright, enthusiastic researchers, several having recently acquired Ph.D.s, some still at the undergraduate level on a work-term, and others who are recent graduates at the Bachelor level or Master level graduates. When last counted, 16 different disciplines in Science and Engineering were represented. This interdisciplinary approach to focused research is very effective in meeting the challenges identified in the research programs.

When looking at how the non-profit organizations like C-CORE contribute to the development of technology for the exploitation of petroleum resources for the benefit of Canadians, it is important to first review what the organization is intended to achieve. These objectives should be reflected in the mandate. In the case of C-CORE, the Centre's mandate has four components. The first one is to undertake research to assist in solving technical problems faced in the development of offshore resources. C-CORE operates within a 5-year research plan, a plan which has been drawn up in close consultation with industry and

government and which is updated every year at a Workshop attended by the financial and logistic supporters of C-CORE, the Associates. After this review, the research programs are fine-tuned for approval by the Research Advisory Committee of the Board of Governors of C-CORE. At the half way point in the 5-year research plan, a major overhaul is undertaken to reflect the priorities identified by the leaders of science and technology of industry and government. All the Associates of C-CORE are invited to attend this major review workshop with other experts from industry and government. Their opinions are sought and listened to. A draft plan is generated and widely circulated following this review workshop. Feedback on the plan is sought and received. Final revisions are made and the research plan is then taken before the Board of Governors and its committee with the financial plan that reflects the support required to undertake research. If the Board approves the research and financial plan, it is implemented. C-CORE then has the responsibility to secure the funding to complete the research objectives within the timeframe set out in the plan. So, if the first objective includes a research program that is truly "market pulled," reflecting the priorities of industry and government, then it is fair to say that that objective has been met.

The second objective identified in the mandate is one of training. Over a period of 10 years, C-CORE has provided research opportunities for over 80 young scientist or engineers who have then moved off into industry, government or university careers. Over 150 students, ranging from a four month work-term co-op student to Ph.D. candidates, have passed through C-CORE. The Centre has provided 22 C-CORE Fellowships, financial support to students pursuing advanced degrees in Ocean Engineering or Marine Geoscience. This is not a bad record for a self-reliant research organization.

The third objective of the mandate calls for C-CORE to contribute to the development of the region as a major centre for cold oceans research and development. In terms of technology, the record speaks for itself. In terms of the economy, (a most important feature to consider for any organization operating in the province of Newfoundland and Labrador, whether industry, government or university) C-CORE has generated over 20 million dollars of research funds, 90% of which has originated from outside the province.

Finally, the Centre's mandate states that it must disseminate knowledge quickly and efficiently. This is achieved by the Ocean Engineering Information Centre. It not only ensures that the C-CORE reports and papers are widely circulated to its Associates and other interested parties; it also maintains an oceans engineering reference resource that is extensively used by engineers and scientists from industry, government, universities, and by research students.

On balance, the objectives of C-CORE as reflected in the mandate have been and continue to be met. The research product, as reflected by its research publications, now stands at over 150 in the last five years, with a further 60 expected in the current year.

It is difficult, and it perhaps could be misleading, to identify a single factor that is the most important in the success of a university-based, non-profit,

self-reliant research institute. But many people would agree, and it is certainly my view, that industry participation in a significant way is essential. Participation does not only mean providing financial support. It also means "people" involvement. The Board of Governors of C-CORE has a major influence on all that is achieved by C-CORE. The active participation on the Board by senior representatives of the C-CORE Associate companies, senior representatives of the federal government, provincial governments, Memorial University, and the local business community is essential to the operation of C-CORE. Their experience in business and research matters is invaluable. The Associates' representatives are essential to the viability of the research plan. Not only do they bring the perspective of their organization to the research planning at C-CORE, but they communicate back the process and the results to the parent organization. They, the "user" of the research product, being a technical knowledge base to C-CORE's research planning process which is necessary to keep it finely tuned to the needs of industry and government. It is through this interactive process at the Board level and at the Associates level that C-CORE can design the financial plan required to support the research programs. The financial plan, which will enable the realization of the research plan, not only needs to provide the best estimate possible of the amount of funds required to achieve the research objectives, but also where the money will come from. It is, however, up to the researchers at the institute to ensure that the objectives of the research programs and Centre's financial requirements are met. It they are not achieved, then either the research plan or the financial plan or the people are not right and changes must be made in one or the other or in all three if the Centre is to continue to thrive and contribute.

C-CORE Mandate

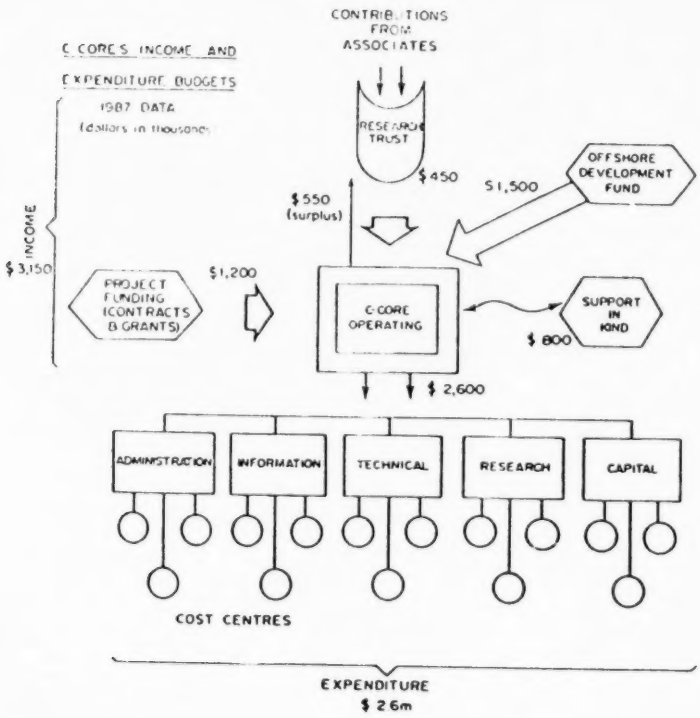
TO HELP DEVELOP ENGINEERS AND SCIENTISTS COMPETENT TO WORK WITH THE COLD OCEAN ENVIRONMENT.

TO IDENTIFY IMPEDIMENTS TO NORTHERN OFFSHORE RESOURCE DEVELOPMENT AND TO CONTRIBUTE TO REMOVING THEM OR TO INTEREST OTHERS IN THE CHALLENGE AND TIMELY SOLUTION OF SUCH PROBLEMS.

TO STIMULATE THE TIMELY PUBLICATION OF THE RESULTS OF COLD OCEAN ENGINEERING RESEARCH.

TO CONTRIBUTE TO THE DEVELOPMENT OF NEWFOUNDLAND AND LABRADOR AS A CENTRE FOR COLD OCEAN ENGINEERING.

SOURCES OF FUNDING



In 1985, C-CORE participated in a major iceberg research project called the Dynamics of Iceberg Grounding and Scouring (DIGS) off the coast of Labrador. The objective was to observe and accurately measure the movements of several targeted icebergs to determine mechanism of grounding and scouring events. The photo shows the splitting and grounding sequence of an eight million tonne berg; the arrow in each photo points to the same spot on the grounded portion of the berg. An instrument package was mounted on the grounded section at the time of the event. The mass of the iceberg was determined so that the force acting on the seabed as a result of an iceberg grounding was documented for the first time.

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